

TABLE 11. PERCENT OF FAMILIES EXCEEDING CATASTROPHIC THRESHOLDS,
HOLDING MEDIAN FAMILY INCOME AND DEMOGRAPHIC FACTORS
CONSTANT

Thresholds		Percent of Families		Percent Change,
1974	1978	1974	1978	1974-1978
\$ 3,000	\$ 4,102	2.34	3.47	48
5,000	6,836	0.84	1.53	82
10,000	13,672	0.22	0.40	82
20,000	27,345	0.04 ^a / _—	0.07	75 ^a / _—

NOTE: All values in current (nominal) dollars.

a. Unreliable estimates because of small group above the threshold.

ly income. This rapid rise in medical expenditures will increase the incidence of high-cost illness--both in nominal terms and relative to income--even if expenditures for high-cost illness grow no more quickly than other medical expenditures.

This section assesses whether there was growth in high-cost illness between 1974 and 1978 above and beyond the growth caused by increases in total or average medical expenses. In other words, it gauges whether expenditures for high-cost illness have grown disproportionately, relative to the growth of medical expenditures in general. To assess this, medical expenses were inflated so that each year's mean expense was the same. Both these inflated expenses and the threshold amounts are expressed below in 1982 dollars.

Between 1974 and 1978, expenditures for high-cost illness rose faster than expenditures for all covered services, but the difference was relatively small. This is shown by growth in the percentage of total expenses attributable to expenses above the thresholds, holding average expenses constant across all five

years (see Table 12). Viewed as a percentage of total covered medical expenses, expenses above either a \$10,000 or a \$20,000 threshold increased by about 20 percent. This corresponds to an annual increase of between 4 and 5 percent. If \$3,000 or \$5,000 thresholds are used, the increases are much smaller, roughly 5 and 11 percent, respectively, over the five-year period.

TABLE 12. EXPENSES ABOVE CATASTROPHIC THRESHOLDS AS PERCENT OF TOTAL EXPENSES, HOLDING AVERAGE MEDICAL EXPENSES AND DEMOGRAPHIC FACTORS CONSTANT

Threshold	1974	1975	1976	1977	1978	Percent Change, 1974-1978
\$ 3,000	37.8	37.6	38.1	38.2	39.7	5
\$ 5,000	23.8	23.8	24.7	24.9	26.3	11
\$10,000	11.0	10.6	12.2	12.6	13.3	21
\$20,000	4.5	3.7	5.2	5.5	5.3	18

NOTE: Average expenses for all years adjusted to 1982 average.

Over the five-year period, the incidence of high-cost illness also increased when each year's expenses were adjusted to a constant (1982) average, but only if the higher thresholds were used to define high-cost illness (see Table 13; compare Table 10). The proportion of families exceeding the lower thresholds (\$3,000 and \$5,000) actually declined slightly. The proportion of families exceeding \$10,000, however, increased about 13 percent, or 3 percent annually. The major change occurred in the proportion of families exceeding \$20,000; this increased 33 percent over the period, an average of over 7 percent annually.

This pattern confirms the earlier conclusion that the growth in incidence of high-cost illness--either in nominal terms or relative to incomes (Tables 10 and 11)--is primarily a result of increases in the average cost of medical care. Increases in high-cost illness above and beyond those caused by the rising

TABLE 13. PERCENT OF FAMILIES EXCEEDING CATASTROPHIC THRESHOLDS,
HOLDING AVERAGE MEDICAL EXPENSES AND DEMOGRAPHIC
FACTORS CONSTANT

Threshold	1974	1975	1976	1977	1978	Percent Change, 1974-1978
\$ 3,000	11.1	11.0	10.8	10.7	10.6	-5
\$ 5,000	5.4	5.5	5.2	5.2	5.2	-4
\$10,000	1.5	1.6	1.5	1.5	1.7	+13
\$20,000	0.36	0.37	0.38	0.41	0.48	+33

NOTE: Average expenses for all years adjusted to 1982 average.

average cost of medical care play a small role, except when the highest (\$20,000) threshold is used. In that instance, disproportionate increases in high-cost illness relative to average medical care costs contribute roughly 10 percent of the nominal increase in high-cost illness, and about 40 percent of the increase relative to incomes.

THE CONTRIBUTION OF HIGH-COST ILLNESS
TO THE OVERALL INCREASE IN MEDICAL EXPENDITURES

Although the increase in high-cost illness relative to medical expenses is appreciable in percentage terms when the highest threshold is used, very little of the overall increase in medical expenses can be attributed to this disproportionate growth in high-cost illness. For example, had expenses above a \$20,000 threshold increased at the same rate as expenses below \$20,000, total expenses would have grown about 65 percent instead of the 66 percent observed. Similarly, had expenses above a \$3,000 threshold grown at the same rate as expenses below \$3,000, total expenses would have grown about 61 percent.

That the disproportionate growth in high-cost illness contributed little to the overall increase in medical expenditures, however, does not indicate that high-cost illness itself played little role in that increase. Rather, it indicates that high-cost illness contributed to the total growth in expenditures in rough proportion to its contribution to current expenditures. For example, the total expenses of families exceeding a \$10,000 threshold contributed roughly 30 percent of the increase in total expenditures, just as they accounted for roughly 30 percent of current expenses. Likewise, the portion of their expenses above that threshold accounted for about 13 percent (see Table 1 in Chapter II). The total expenses of families exceeding \$20,000 contributed roughly 14 percent of the total increase in expenditures, and their expenses above that threshold contributed about 5 percent of the total increase.

CHAPTER V. IMPLICATIONS FOR FEDERAL POLICY

The patterns of high-cost illness analyzed in the preceding chapters have important implications for several areas of health policy, including the allocation of medical care resources, catastrophic health insurance, and the control of medical-care costs.

THE ALLOCATION OF MEDICAL RESOURCES

Many of the issues raised about high-cost illness fundamentally concern the allocation of medical resources. For example, many question the extent to which resources are concentrated on high-cost illnesses and whether that concentration is growing more pronounced over time.

This paper confirmed the common expectation that in the non-elderly, non-poor population, a sizable proportion of medical resources are concentrated within any one year on a relatively small number of high-cost families. For example, the 11 percent of families with annual expenses over \$3,000 account for fully two-thirds of total medical expenses.

On the other hand, the multiyear analyses in Chapter III indicated that such a one-year view is in some senses misleading, in that it overstates the concentration of medical resources on a few families. Because of the rapid turnover among high-cost families, a far larger proportion of families experience at least one high-cost year during a period of several years. For example, fully a fourth of all families have annual expenses above \$3,000 at least once during a period of three consecutive years, and the proportion exceeding that threshold over a longer period--say, a decade--is presumably substantially higher.

This pattern of rapid turnover has important implications for understanding the subsidies inherent in health insurance, whether private or public. A one-year view of the data gives the impression that there is a very large subsidy of a small number of high-cost families by a much larger number of low-cost families. Over the long term, however, some of these low-cost families are in effect subsidizing their own past or future high-cost years. That is, many of the families subsidizing high-cost families in one year will in turn be subsidized, often by the same families, at a later date.

In the non-elderly, non-poor population, the concentration of medical resources on high-cost families is growing, but only slowly. For example, the 5 percent of families with the largest expenses accounted for 47 percent of total expenses in 1974, and 49 percent in 1978. This contradicts a widely held assumption that expenditures for high-cost illness are growing substantially more rapidly than medical expenditures in general in this part of the population. Nonetheless, over the long term--say, the remainder of the century--continuation of current trends would produce a very marked increase in the concentration of resources in the care provided to families experiencing high-cost years. The effects on health status of such a change in the allocation of resources are not clear, however.

CATASTROPHIC HEALTH INSURANCE

The analyses in Chapters II and III of the incidence of high-cost illness indicate the need for protection against the expenses of high-cost illness, in that a sizable proportion of non-elderly, non-poor families would face catastrophic financial burdens in its absence. If the historical trends examined in Chapter IV continued, however--in particular, if medical expenditures continued to rise substantially more rapidly than families' incomes--the cost of any given amount of protection against catastrophic expenses would rise rapidly. Alternatively, if the costs of a catastrophic insurance plan, either private or public, were held constant, the protection offered by the plan--relative to families' incomes--would fall sharply. This dilemma would arise regardless of the plan's original cost. Moreover, any likely indexing of the plan--for example, adjusting its provisions to keep pace with rising incomes--would only ameliorate, but not solve, the problem.

If the amount of protection under such a plan was maintained, the resulting increase in costs would have two parts. The catastrophic expenses of the typical high-cost family--and hence its benefits under a catastrophic insurance plan--would grow rapidly. In addition, a growing proportion of families would exceed any given catastrophic threshold and therefore qualify for benefits. Thus, the growing financial burden of catastrophic illness would be transferred to the shrinking proportion of families that were not affected by such illnesses.

This steep rise in the cost of catastrophic insurance would erode one of the important reasons why some proponents have supported catastrophic insurance proposals. Some proponents have maintained that increased or universal catastrophic insurance

would protect affected families from the most burdensome medical expenses, while keeping the cost of this increased protection relatively low. Over the long term, however, costs could be kept low only by reducing coverage, thereby again increasing the financial burden on affected families or--through the mechanism of bad debts--on governments, other patients, or others paying insurance premiums.

COST CONTAINMENT

The patterns of expenditures discussed in the previous chapters suggest that several possible strategies for containing the costs of medical care face serious limitations.

One strategy that would probably have only limited effectiveness would be to focus cost-containment efforts primarily on only high-cost illness. Considerable attention has been devoted recently to the escalation of expenditures for high-cost care--particularly, "heroic" care of the terminally ill--and some have suggested that a failure to control expenditures for heroic care is a major cause of the current increase in medical expenditures.¹ In the segment of the population studied here, however, expenditures for low-cost and high-cost illness grew at nearly the same rate, and the small disproportionate growth of expenditures for high-cost illness contributed little to the overall increase in expenditures.²

Reducing the growth of heroic and other high-cost care to a rate lower than the growth of other medical expenses would have a correspondingly larger effect, but even that would likely leave most of the problem of rising costs unsolved. For example, if growth of expenditures above \$3,000 during the five years covered by the study had been held down to the rate of the increase in median family income--a far slower rate of increase than that shown by other medical expenses--the overall growth in medical

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1. For example, see Ezekiel Emanuel, "The Kidney Experiment," The New Republic (August 30, 1982), pp. 12-14.
 2. As noted earlier, if there had been no disproportionate growth in expenditures above \$3,000 per year--which includes far more than those treatments that most would call heroic--the overall growth in expenditures would have been 61 percent instead of the observed 66 percent during the five-year period covered by the study.

expenditures would have been reduced to 52 percent from the observed growth of 66 percent.

More generally, the findings in the previous chapters suggest the fruitlessness of attempts to identify limited subgroups of the population that are particularly responsible for the rise in medical costs and to make such groups bear the brunt of cost-containment efforts. Within the non-elderly, non-poor, employed population, there appear to be no such limited groups, in that the increase in medical expenditures is nearly uniform. This does not imply that there are no specific types of care or technologies that contribute disproportionately to the rise in medical costs. It suggests, however, that the impact of such technologies and types of care, taken together, are diffused throughout the entire distribution of medical expenses, affecting low-cost, moderate-cost, and high-cost families nearly equally.

These conclusions, however, are subject to one caveat. It is possible--but not certain--that heroic treatments play a different role in the growth of expenditures among the elderly, who were excluded from this report.

The rapidity and uniformity of the increase in medical expenditures also suggest that although increased cost sharing could have a sizable impact on the growth of medical expenditures in the short term, the long-term prospects of this cost-containment mechanism are more problematic. Over the long term, the effectiveness of cost sharing as a cost-containment mechanism could be maintained only by allowing the cost-sharing burden to grow substantially from any level set currently.

In recent years, cost-sharing provisions in both private insurance and legislative proposals have focused increasingly on low and moderate expenses. The imposition of sizable deductibles has been one means of accomplishing this. In addition, cost-sharing is often capped (by means of a "stop-loss" provision), so that once expenses reach a specified amount, no further coinsurance is imposed. This protects families from the largest medical expenses, while leaving the bulk of total medical expenses subject to the restraining influence of cost sharing.

If medical expenditures continue to rise substantially more rapidly than incomes, however, it will be impossible to maintain whatever balance is established initially between effectiveness and burden on affected families. If the cost-sharing provisions were adjusted to maintain their impact in the face of rapid cost increases, the burden faced by many families would increase

rapidly. If, conversely, the provisions were adjusted to avoid increases in the burden faced by many families, the proportion of total expenses subject to cost sharing--and, accordingly, the impact of the cost-sharing provisions on the growth of total expenditures--would rapidly decline. In this case, the restraint on medical expenditures could be maintained only by bringing additional cost-containment mechanisms to bear.

For example, if cost-sharing provisions were indexed to keep pace with family incomes, the real maximum burden faced by families with expenses above the "stop-loss" would remain constant. The proportion of total medical expenses subject to cost sharing, however, would fall rapidly, because an ever greater proportion of expenses would lie above the stop-loss limit. The aggregate impact of cost sharing on the growth of medical expenditures would therefore decline. Nonetheless, the average financial burden on families who fail to reach the cost-sharing limit would rise, for the average expenses of these low- and moderate-cost families would rise faster than their incomes.

Finally, the unusually large subsequent-year expenses of many high-cost families (Chapter III) indicate a sizable potential for "adverse selection" (or "anti-selection") in cost-containment proposals that rely on consumer choice among competing insurance plans.

Adverse selection refers to the tendency of families to choose insurance plans on the basis of their anticipated expenses. Families expecting major expenses would find it in their interest to select plans with extensive benefits, even if the premium costs are higher. Families expecting only minor expenses, on the other hand, could save premium costs by choosing plans with relatively limited benefits. The effect of adverse selection is to drive up the cost of relatively extensive plans relative to the average value of their benefits, gradually making them less competitive.

To some extent, many high-cost families may be able to anticipate their subsequent large expenses and may therefore contribute substantially to adverse selection. Not all high-cost families, of course, will anticipate their future expenses, and some may fail to make the financially most advantageous choice of plans regardless. Many, however--for example, some of the families of cancer patients or individuals with chronic heart disease described in Chapter III--would correctly anticipate continued

large expenses, and the magnitude of those expenses would provide them with a strong incentive to choose a plan with extensive benefits.³

3. Moreover, the fact that their subsequent-year elevation of expenses is largely not attributable to demographic factors indicates that insurers could not protect themselves against this source of adverse selection by charging varied premiums to families with different demographic characteristics.

APPENDIXES

This report is based on the claims data of the Blue Cross-Blue Shield Federal Employees Health Benefit Plan for the years 1974 through 1978. These data were selected for several reasons:

- o They include enough families to permit reliable analysis of low-frequency, high-cost illnesses¹;
- o They permit following individuals and families over a period of years; and
- o They are relatively complete records of family medical expenses, because the Blue Cross-Blue Shield plan provides extensive coverage.

In all cases, all covered expenses reported to Blue Cross were included in the data, regardless of whether the expenses were paid out-of-pocket by the family (because of cost sharing), reimbursed by another insurer, or reimbursed by Blue Cross. It has often been noted, however, that in insurance plans with deductibles, some families with small expenses do not bother reporting their expenses to the insurer. Since this Blue Cross-Blue Shield plan did impose a deductible on some expenses, some small covered expenses were presumably not reported. This should have no substantial effect, however, on analyses of high-cost illness.

Several categories of families were deleted from the data before analyses were conducted. In most cases, the deletions were designed to make the sample more comparable to the population of interest (the non-elderly, non-poor employed; see Chapter I).² All contracts headed by an individual aged 65 or older were

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1. The data include claims records of over three million contracts, but only a small fraction of those records were used, as explained below.
 2. More specifically, the population of interest was defined as families headed by non-elderly individuals employed full time and earning at least \$7,200 in 1978 dollars.

deleted. All annuitants (including both retirees and survivors) were deleted in order to remove disabled workers, who were not germane to the study. (The set of annuitants aged 64 or less includes able-bodied early retirees, some of whom would have been germane to the study because they might have remained employed had they been in the private sector. The data, however, did not distinguish between able-bodied and disabled annuitants, so it was necessary to exclude all annuitants.) Finally, families that chose the "low option" plan were excluded for technical reasons.

Once these groups had been excluded, a variety of random samples of families were drawn. Most of the analyses reported below are based on samples of between 127,000 and 141,000 families, depending on the year. In some cases, when such large samples were not required to obtain reliable estimates, subsamples of between 15,000 and 20,000 families were used.

A separate sample was defined for each year, consisting of two groups: (1) those contracts active for the entire year, and (2) contracts active at the beginning of the year but terminating during the year. The latter group was incorporated because it includes contract holders who died during the year--a group that should ideally be included in any analysis of catastrophic illness. (In practice, however, it made little difference whether such cases were included or excluded.)

In most cases, the yearly samples were then weighted to reflect a constant (1980) demographic mix. This was done by dividing each yearly sample into 495 cells defined by region, age of contract holder, family size, and sex of contract holder.³

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3. All "self-only" contracts were treated as unmarried individuals. In practice, some individuals with self-only contracts are married. For example, it is sometimes advantageous for a married couple with no children, if both individuals are working, to purchase separate self-only contracts rather than one family contract, since the premium for family contracts includes costs for coverage of children. It is not possible, however, to distinguish such instances from true single-person families. Treating all self-only contracts as if they were single individuals may bias average expenditures downward, since some married individuals with self-only contracts are also covered by a family contract and may submit their claims to the insurer of the latter contract. When Blue-Cross had record of such occurrences (through
- (Continued)

Each observation was weighted so that the weighted number of families in each cell in each sample equalled the number of families in 1980 in the corresponding cell of the population of interest.

Once the data were weighted to a constant demographic mix, they were inflated so that the average family expense was constant from year to year. For convenience, these "constant-dollar" expenses are expressed in 1982 dollars. This inflation was accomplished in two steps. First, each year's data were inflated to 1978 (the latest year of data) by multiplying every expenditure by the ratio of the average annual family expense in 1978 to the average in the year in question. Second, all expenses were multiplied by a factor reflecting projected increases in covered expenditures in this population from 1978 to 1982.

3. (Continued)

"co-ordination of benefits" provisions), the expenses involved were incorporated into the analyses reported in this paper. When Blue Cross had no record of such expenses, however, the total annual expenditures for the individual involved were underestimated.

In almost all longitudinal studies--that is, studies using data that extend over a period of time--some cases are lost between the first collection of data and the last. This gradual loss of cases, generally called "attrition," can cause substantial bias if the cases that are lost are numerous and differ systematically from those that remain. In some longitudinal studies, a parallel source of potential bias is caused by cases that enter the data base during the period being studied. This gradual addition of cases can be called "accretion."

This appendix describes the sources of attrition and accretion in the data base used in this report and evaluates their importance. Three questions are addressed:

- o What proportion of cases left or joined the data base during the five years covered by the study?
- o How do the attrition and accretion groups differ from the cases remaining in the data base for the full five years?
and
- o What amount of bias do attrition and accretion produce?

The analyses found that attrition and accretion were present and that the attrition and accretion groups differed from those families that remained in the sample. The amount of bias caused by attrition and accretion, however, while varying from analysis to analysis, is typically very small. Both the relatively small size of the attrition and accretion groups and the way in which the analyses were conducted contributed to the small size of the bias.

For the sake of clarity, the extent of attrition and accretion within a single year are first analyzed separately. Those sections are followed by an analysis of the joint effects of attrition and accretion in two- and three-year samples. A subsequent section considers the effects of attrition and accretion on the analyses of historical trends in Chapter IV. A final section describes how attrition-related demographic factors were controlled in this report.

LIMITATIONS OF THIS APPENDIX

This appendix is designed solely to assess attrition and accretion as they affect the analyses reported in this paper. It is not a comprehensive analysis of the characteristics of those joining or leaving the Federal Employees' Blue Cross plan, and it is even less a comprehensive analysis of "plan-switching" in the federal employees' health benefit program as a whole.

The analyses in this appendix were designed to parallel as closely as possible those reported in this paper. Accordingly, they exclude:

- o all contracts headed by individuals over the age of 64;
- o all low-option contracts, insofar as they could be identified;¹ and
- o in most instances, all mental health expenses, except where noted otherwise.

In addition, several of the analyses in this Appendix exclude all contracts headed by annuitants, and others hold annuitant status constant by statistical means.

The analyses presented here consider primarily attrition and accretion in 1976, 1977, and 1978. This reflects the fact that the analyses in the body of this paper relied most heavily on data from those years. It is also important to note that patterns of attrition and accretion may change over time. Such changes could result from many factors, including changes in the premiums and benefits of competing insurance plans, changing composition of the work force, and the aggressiveness of marketing efforts. There is evidence, for example, that older workers, and those who have been in the Blue Cross plan longer, are less likely to change to other plans. This suggests that attrition rates may increase over time, as such workers are replaced by younger workers with less tenure. There is also evidence that the characteristics of those changing plans may have varied in recent years depending on relative changes in benefits.

1. Contracts that were high-option at the beginning and end of the five-year period (or at the beginning and end of the contract's life) but low-option for some periods in between could not be distinguished from other high-option contracts.

SOURCES OF ATTRITION AND ACCRETION

The patterns of attrition and accretion in this paper are determined by the use of insurance claims as the data base. Attrition can be caused by:

- o termination of federal employment;
- o death;
- o voluntary cancellation of insurance coverage; or
- o changing to a different federal employees' insurance plan.

Accretion can be caused by:

- o commencement of federal employment;
- o initiation of insurance coverage by a previously uninsured federal employee; or
- o changing from a different federal employees' insurance plan.

Some of these events (for example, change in employment) can occur at any time, but others (for example, initiation of insurance by a previously uninsured employee) can only occur at times specified by the federal government. Several other factors that contribute to attrition in most longitudinal studies (for example, changes in residence) have no effect in this data base.

ATTRITION: WHO LEFT THE PLAN, AND HOW MUCH BIAS DO THEY CAUSE?

Patterns of attrition were examined by comparing the contracts that became inactive during 1978 with those that were active for that entire calendar year. A total of 16,335 contracts were included in this part of the analysis.

About 4.7 percent of the contracts that were active at some time during 1978 became inactive during the calendar year (see Table B-1). Nearly 40 percent of the cases of attrition--1.8 percent of all contracts--involved families changing to other federal health insurance plans during "open season," an annual period during which all federal employees are free to cancel their existing coverage and join any other federal plan. The remainder became inactive for a variety of reasons, including death, leaving federal employment, and voluntary cancellation of insurance coverage. Although the open season is held in the last quarter of each year, changes made at that time become effective at the beginning of the first pay period that starts in the following year. Accordingly, in Table B-1, almost all of the changes to other federal employees' health benefit (FEHB) plans occurred during the

TABLE B-1. ATTRITION IN 1978, BY REASON FOR LEAVING PLAN AND CALENDAR QUARTER (In percent of total contracts, number of contracts in parentheses)

Reason for Leaving	First Quarter	Second Through Fourth Quarters	Total
Changes to other FEHB Plans ^a	1.7 (282)	0.1 (12)	1.8 (293)
Termination ^b	0.5 (86)	1.6 (256)	2.1 (342)
Other (Cancellation of Payroll Office Transfer) ^c	0.2 (37)	0.5 (89)	0.8 (127)

Total	2.5 (405)	2.2 (357)	4.7 (762)

NOTE: Components may not sum because of rounding.

a. "FEHB plans" are federal employees' health benefit plans.

b. Terminations do not include cases in which the contract holders voluntarily end participation in the plan. Deaths of contract holders appear as terminations unless surviving family members maintain enrollment.

c. Cancellations include all cases in which the contract holder voluntarily ends participation in the plan.

first calendar quarter. In contrast, attrition for other reasons was distributed approximately uniformly throughout the year.

Characteristics of Those Who Left the Plan

On average, families that left the plan in 1978 had lower medical expenses than those who remained in the plan. The two groups also differed demographically, however, and adjusting for the demographic differences made the expenditures of those who left the plan much more similar to the expenditures of those remaining.

Because the data include no information on the medical expenses of those who left the plan in 1978 (the "attrition sample") after they left, it was necessary to consider only their expenses in 1977, the year before their coverage ended. For the sake of comparability, the expenses of those who remained through 1978 (the "stable sample") were also tabulated for 1977.²

The attrition sample as a whole had average annual family expenses about \$209 (25 percent) lower than the stable sample in 1977 (see Table B-2). Those who left to change into another federal employees' plan had particularly low expenses--\$273 (33 percent) below the stable sample. In insurance terminology, this constitutes "anti-selection" or "adverse selection"--in this case, a tendency for lower-cost contract holders to opt out of the plan, thus driving up the insurer's average benefit payments and premium rates.

TABLE B-2. ANNUAL MEDICAL EXPENSES OF FAMILIES LEAVING THE PLAN IN 1978 AND THOSE REMAINING (In 1977 dollars and percentages)

	All Remaining (Stable Sample)	All Leaving (Attrition Sample)	Changed to Other Plan	Terminated	Other
1977 Expenses	\$839	\$630	\$566	\$679	\$658
Dollar Difference From Those Remaining	---	-209	-273	-160	-181
Percentage Difference From Those Remaining	---	-25	-33	-19	-22

2. All attrition tabulations reported here excluded mental health expenses, in order to be comparable to the principal analyses reported in the paper. Identical tabulations were also computed including mental health expenses; they are presented in Appendix C.

For purposes of this report, it was critical to ascertain what portion of the attrition sample's lower expenses can be attributed to those demographic factors about which data were available. To the extent that the difference is attributable to such factors, it is possible to make adjustments to remove the potential bias resulting from attrition.

The attrition sample differed from the stable sample with respect to several demographic factors that could affect medical expenses (see Table B-3). The contract holders in the attrition sample were about eight years younger than their counterparts in the stable sample. Annuitants were far less numerous among those leaving the plan than among those remaining, comprising only 7.3 percent of the attrition sample but 24.6 percent of the stable sample. Female contract holders were somewhat more likely than males to leave the plan; female-headed contracts comprised 37.8 percent of the attrition sample but only 30.6 percent of the stable sample. In addition, the average family size in the attrition sample was slightly smaller than in the stable sample: 2.6 versus 2.9 persons.

Multiple regression analysis was used to separate the effects of attrition and demographic factors on expenses. Two basic specifications were used. The first estimated 1977 expenses from a dichotomous attrition variable (left the plan in 1978 vs. did not leave) and the demographic variables available in the data base: age of contract head, sex of contract head, family size, region, and annuitant status. The region variable was a six-way contrast using modified census regions: Northeast, Northcentral, West, "D.C. plus" (the District of Columbia, Maryland, and Virginia), South outside of D.C. plus, and other (territories). Annuitant status was a three-way contrast: employees vs. employee annuitants vs. survivor annuitants. Quadratic forms of age and family size were entered to handle non-linearities. The second specification differed only in that the dichotomous attrition variable was replaced by a set of three variables classifying those who left the plan by their reasons for doing so: changes to other plans, terminations, and other reasons.

After this adjustment for demographic differences, the expenses of those families that left the plan were only \$80 (10 percent) lower than the expenses of the stable sample. This \$80 difference (which is small enough to be statistically unreliable) compares to a \$209 difference before adjustment (see Table B-2).